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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BERMAN, JACK I	
ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 11/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/891,611	NAKASUJI ET AL.	
	Examiner	Art Unit	
	Jack I. Berman	2881	

-- The MAILING DATE of this communication appears on th cover sh et with the corr spondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 September 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-104* is/are pending in the application.

4a) Of the above claim(s) *15-28,51-82,86,87,94-99 and 101-104* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14,29-42,44-50,83-85,88-93 and 100* is/are rejected.

7)☒ Claim(s) *43* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Applicant's election without traverse of Claims 1-14, 29-50, 70, 83-85,88-93, and 100 in the paper filed on September 8, 2003 is acknowledged. However, upon closer reading, Claim 70 actually link(s) inventions I and VII. The restriction requirement between the linked inventions is subject to the nonallowance of the linking claim(s), claim 70. Upon the allowance of the linking claim(s), the restriction requirement as to the linked inventions shall be withdrawn and any claim(s) depending from or otherwise including all the limitations of the allowable linking claim(s) will be entitled to examination in the instant application. Applicant(s) are advised that if any such claim(s) depending from or including all the limitations of the allowable linking claim(s) is/are presented in a continuation or divisional application, the claims of the continuation or divisional application may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Where a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. *In re Ziegler*, 44 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 47, 49, and 50 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains,

or with which it is most nearly connected, to make and/or use the invention. It is not clear how disposing the primary and secondary optical systems in two rows and in plural columns prevents a path of secondary charged particles deflected by one of the E x B separators from interfering with a path of the secondary charged particles deflected by the other E x B separator. The disclosure was so unclear that no comparison with the prior art could be made.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 11, 30, 39, and 91 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 11 contains the limitation: "the primary optical system has a function of scanning the charged particle beams at a distance greater than the interval of irradiation of the charged particle beams." Claim 30 contains the limitation: "the plurality of the primary charged particle beams are arranged so as to minimize a maximum value of a distance between optional two points out of the points of irradiation formed two-dimensionally on the surface of the sample." Claims 39 and 91 contain the limitation: "an amount of deviation is set such that an amount of detection of the secondary charged particles obtained when a sample with no pattern is disposed on a surface of the sample minimizes a difference thereof between the plurality of the apertures." The language of these limitations is so garbled that it is not clear what subject matter is intended to be claimed. What is meant by "a distance greater than the interval of irradiation of the charged particle beams"? If two points are optional, how can the distance between them be either maximum or minimum? Doesn't the fact that they're optional make the distance between them completely arbitrary? What difference is being minimized in claims 39

and 91? Therefore, the invention claimed could not be compared to the prior art. The lack of a rejection based upon prior art should not be construed as a determination that the claims contain allowable subject matter, only that the claims are incomprehensible.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1, 9, 10, 14, 31-34, and 85 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,430,292 to Honjo et al. Honjo et al. discloses an inspection apparatus (2) for inspecting an object of inspection by irradiating the object of inspection with charged particles comprising: a working chamber controllable into a vacuum atmosphere for inspecting an object of inspection (not labeled but inherently required because electron beam optical systems only work in a vacuum); a beam generating means (21, 101, 311) for emitting the

charged particles as a beam; a primary electronic optical system (25) wherein a plurality of beams (B) is guided to irradiate the object (S) of inspection held in the working chamber, and a secondary optical system (630, 631 in Fig. 37) leads secondary charged particles generated from the object to at least one detector (632) where they are detected and the detector output signals are led to an image processing system (355) which forms an image based on the secondary charged particles; a data processing system (356) for displaying and/or memorizing a state information of the object based on output of the image processing system; and a stage system (3)for holding the object so as to be movable relative to the beam. Honjo et al. also teaches throughout the patent that the apparatus is useful for detecting defects on wafers during or after a manufacturing process. At lines 52-65 in column 27, Honjo et al. describes how the plurality of the charged particle beams are irradiated at positions separated by distance resolution of the secondary optical system. At lines 53-58 in column 9, Honjo et al. teaches that inspection, including the detection of secondary charged particles, occurs while transferring the sample. At lines 29-32 in the same column, Honjo et al. teaches that the points of irradiation by the primary charged beams to be formed on the surface of the sample may be arranged in two dimensional directions, i.e. in rows and columns. At line 63 in column 9 through line 21 in column 10, Honjo et al. teaches that the plurality of charged particle beams can be formed by directing a primary beam (B) through an aperture plate having a plurality of apertures adapted to form a plurality of charged particle beams, the beams being formed by containing particles generated by the beam generating means to form irradiation points disposed in rows N in a direction of transferring the sample and in columns M in a direction perpendicular to the direction of transferring the sample, and the apertures are located within a range of a predetermined electron density of the charged

particles emitted from the beam generating means. The scanning described by Honjo et al. can inherently be described by the equation claimed in claim 33 of the instant application because the variables used in this equation are so completely arbitrary. The intended use of the detected secondary electron beam claimed in claim 34 cannot patentably distinguish the claimed invention because no structure for performing that use is set forth in the claim.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2-4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honjo et al. in view of U.S. Patent No. 6,344,750 to Lo et al. Honjo et al. does not teach how the object under test is moved in or out of the (inherently required) working chamber, to isolate the object under test from vibrations, to apply a voltage to the object under test, how the object under test is held, or how the positioning of the object under test is determined. Lo et al. discloses scanning electron beam inspection apparatus similar to Honjo et al.'s and teaches at lines 53-60 in column

7 that transport mechanisms for securing an object under testing for transportation into and out of a testing chamber are conventional. It would have been obvious to a person having ordinary skill in the art to provide the Honjo et al. apparatus with the conventional transport mechanism cited by Lo et al. At lines 48-53 in column 7, Lo et al. teaches to provide a vibration isolator (50) for preventing vibrations of the object under testing. It would have been obvious to a person having ordinary skill in the art to provide such a device in the Honjo et al. apparatus because vibrations would be as detrimental to image resolution in the Honjo et al. apparatus as they would be in the Lo et al. apparatus. At lines 4-20 in column 7 Lo et al. teaches to apply a voltage to the object (22) from a bias source (28) and to increase or decrease this voltage from zero to a predetermined value in order to either optimize voltage contrast or control the landing energy of the primary beam to prevent charge leakage through layers on the object under inspection. It would have been obvious to a person having ordinary skill in the art to apply this voltage to the sample in the Honjo et al. system in order to have the same degree of control as in the Lo et al. apparatus. Lo et al. also teaches, at lines 38-44 in column 7 and lines 38-40 in column 8, that an alignment controller to control the position of the sample is needed and may comprise a laser interference type distance measuring unit (laser interferometer) for observing the surface of the object of inspection and providing feedback to determine the coordinates of the stage. It would have been obvious to a person having ordinary skill in the art to provide such an alignment controller including a laser interferometer as the controller in the Honjo et al. apparatus that Lo et al. teaches is required.

Claims 5, 12, 29, 35-37, 40, 44, 84, 88, and 89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honjo et al. in view of U.S. Patent No. 4,954,705 to Brunner et al.

While Honjo et al. provides a separate secondary electron detector for every primary electron beam, Brunner et al. discloses an inspection apparatus wherein the electronic optical system comprises an objective lens (L2) and an E x B separator (WF), forms a plurality of beams to irradiate the object (see lines 14-22 and 37-48 in column 3), and includes an optical system for accelerating secondary charged particles emitted by irradiation of the beams through the objective lens (see lines 48-51 in column 2), separating the particles by the E x B separator (see Figure 2), and projecting an image of secondary charged particles (see lines 51-62 in column 2), and a plurality of detectors for detecting the image of secondary charged particles (see lines 62-66 in column 2). (The Brunner et al device is also described in Section 3 of the article "Multi-Beam Concepts for Nanometer Devices" by Lischke et al., cited in the Information Disclosure Statement filed on January 18, 2002.) It would have been obvious to a person having ordinary skill in the art to use the electron-optical system disclosed by Brunner et al. to control the multiple electron beams used by Honjo et al. when the Honjo et al. apparatus is used to inspect semiconductors for defects since the Brunner et al. electron-optical system is designed specifically for this purpose. Since both Honjo et al. and Brunner et al. teach that the plurality of charged particle beams may be formed by either providing a plurality of electron beam sources or an aperture plate that divides a single electron beam into a plurality of electron beams, the provision of both a plurality of electron sources and aperture plates that divide the electron beams from each of these electron sources into a larger plurality of beams would have been an obvious duplication of parts.

Claims 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honjo et al. and Lo et al. as applied to claims 2-4 and 7 above, and further in view of U.S. Patent No.

4,911,103 to Davis et al. While Lo et al. teaches a person having ordinary skill in the art to provide the Honjo et al. apparatus with a conventional transport mechanism, including a loading chamber (loadlock subsystem 52), and to provide a vibration isolator (50) for preventing vibrations of the object under testing, neither Honjo et al. nor Lo et al. discuss the problem of dust adhering to a wafer as the loading chamber is evacuated. Davis et al. discusses this problem at line 64 in column 10 through line 31 in column 11 and teaches that it occurs whenever wafers are transferred into a vacuum chamber through a loading chamber and further teaches to solve it by supplying a clean gas to the wafer. It would have been obvious to a person having ordinary skill in the art to apply Davis et al.'s solution to this problem, which would inherently occur in the Honjo et al./Lo et al. apparatus discussed above, by using Lo et al.'s loadlock subsystem as a mini-environment chamber for supplying a clean gas to said object under testing to prevent dust from attaching to said object under testing. Davis et al. also teaches, at lines 20-27 in column 23, that any number of load lock chambers and processing modules and transfer arms can be provided to deliver wafers between any two chambers in any sequence if desired. The provision of a plurality of loading chambers disposed between the mini-environment chamber discussed above and the testing chamber, each adapted to be independently controllable in a vacuum atmosphere, a first transport unit for transporting an object under testing between one of the loading chambers and the mini-environment chamber, and a second transport unit for transporting said object under testing between one of said loading chambers and said testing chamber would therefore have been an obvious duplication of parts in accordance with Davis et al.'s suggestion. Davis et al. also teaches, at lines 42-61 in column 13, to perform a rough alignment of the object of inspection in the XY-directions and in the direction of rotation within

the mini-environment space and it would have been obvious to a person having ordinary skill in the art to also include this function in the Honjo et al./Lo et al. apparatus discussed above for the same reasons discussed by Davis et al., i.e. quicker throughput.

Claims 38, 41, 42, 45, 90, and 92 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honjo et al. and Brunner et al. as applied to claims 5, 12, 29, 35-37, 40, 44, 84, 88, and 89 above, and further in view of U.S. Patent No. 5,892,224 to Nakasuji. Nakasuji discloses a multi-beam inspection system similar to Honjo et al.'s and Brunner et al.'s and further teaches, at lines 13-62 in column 11, that when the plurality of electron beams are formed by means of an aperture plate between the electron source and the sample, the position of the single aperture plate in the direction of the optical axis should be disposed so as to minimize the difference in beam strength of the beams to be delivered from each aperture to the surface of the sample. At lines 41 in column 12 through line 41 in column 13, Nakasuji further teaches to provide a second multi-aperture plate with a plurality of apertures disposed in front of the detector wherein the positions of the apertures formed in the second multi-aperture plate are arranged so as to correct a distortion in the secondary optical system. It would have been obvious to a person having ordinary skill in the art to apply these teachings to the Honjo et al./Brunner et al. apparatus discussed above.

Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Honjo et al. and Brunner et al. as applied to claims 5, 12, 29, 35-37, 40, 44, 84, 88, and 89 above, and further in view of U.S. Patent No. 5,422,486 to Herrmann et al. At lines 16-33 in column 5, Herrmann et al. teaches that the use of two E x B with the directions of the charged particles deflected by their respective electric fields inverse from each other can compensate for beam spreading caused by

use of a single E x B separator. It would therefore have been obvious to a person having ordinary skill in the art to replace the single E x B separator (Wien filter) used in the Honjo et al./Brunner et al. apparatus discussed above with two E x B separators in the manner taught by Herrmann et al. in order to prevent the beam spreading mentioned by Herrmann et al.

Claims 48, 83, 93, and 100 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honjo et al. and Brunner et al. as applied to claims 5, 12, 29, 35-37, 40, 44, 84, 88, and 89 above, and further in view of U.S. Patent No. 6,614,026 to Adamec. Brunner et al. does not specify where the beam scanning means is in relation to the E x B separator (Wien filter), but Adamec teaches, at lines 1-4 in column 8, that such an E x B separator may be located within a deflector of the kind used for scanning so that the deflection field is superimposed upon the crossed electric and magnetic fields. Although the illustrations in the Adamec patent appear to suggest magnetic deflectors, no such limitation appears in the specification and since, as the disclosure discusses, both electric fields and magnetic fields cause deflection of electron beams passing through them, it would have been obvious to a person having ordinary skill in the art that an additional electric field could be superimposed on the crossed electric and magnetic fields as easily as a magnetic field for scanning purposes. The use of such superimposed fields to perform the scanning and separating functions required in the Honjo et al./Brunner et al. apparatus discussed above would have been an obvious substitution of equivalent parts.

Claim 43 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not teach to use the shapes of a plurality of beam forming apertures to correct field astigmatism of the primary optical system in an inspection apparatus.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack I. Berman whose telephone number is (703) 308-4849. The examiner can normally be reached on M-F (8:30-6:00) with every second Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (703) 308-4116. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Jack I. Berman
Primary Examiner
Art Unit 2881

jb
October 23, 2003